

Claims

- [c1] 1n internal fluid filter, comprising:
- a first substrate;
 - a second substrate;
 - a plurality of first and second passages provided in the first substrate; and
 - a plurality of third passages provided in one of the first substrate and the second substrate, each third passage extending between and fluidly connected to one of the first passages and one of the second passages, wherein fluid can flow into the one of the first and second passages, from the one of the first and second passages into the third passages, and from the third passages into the other of the first and second passages, such that particles having a size greater than that which can pass through the third passages are filtered from the fluid.
- [c2] The internal fluid filter of claim 1, further comprising:
- a fourth passage fluidly connected to the plurality of first passages; and
 - a fifth passage fluidly connected to the plurality of second passages.

- [c3] The internal fluid filter of claim 2, wherein a microfluidic device is connected to one of the fourth and fifth passages.
- [c4] The internal fluid filter of claim 2, wherein a fluid source is connected to one of the fourth and fifth passages.
- [c5] A fluid system comprising:
a fluid source;
a fluid sink and
the internal fluid filter of claim 2, wherein the fluid source is connected to one of the fourth and fifth passages and the fluid sink is connected to the other of the fourth and fifth passages.
- [c6] The internal filter of claim 1, further comprising:
a plurality of fourth passages, each fourth passage fluidly connected to at least one of the plurality of first passages; and
a plurality of fifth passages, each fifth passage fluidly connected to at least one of the second passages.
- [c7] The internal filter of claim 1, further comprising:
at least one fourth passage, each fourth passage fluidly connected to at least one of a first subset of the first passages;
at least one fifth passage, each fifth passage fluidly

connected to at least one of a second subset of the first passages;

wherein at least one second passage is fluidly connected by the third passages to at least one of the first subset of the first passages and at least one of the second subset of first passages.

[c8] The internal filter of claim 7, wherein at least one second passage that is fluidly connected to at least one of the first subset of the first passages and at least one of the second subset of first passages comprises:

a first portion fluidly connected to the at least one of the first subset of passages; and

a second portion fluidly connected to the at least one of the second subset of passages;

wherein a microfluidic device is connected to the first and second portions of that second passage.

[c9] An internal fluid filter, comprising:

a first substrate;

a second substrate;

a first layer and a second layer provided between the first and second substrates;

a plurality of first and second passages provided in the first layer; and

a plurality of third passages provided in the second layer, each third passage extending between and flu-

idly connected to one of the first passages and one of the second passages, wherein fluid can flow into the one of the first and second passages, from the one of the first and second passages into the third passages, and from the third passages into the other of the first and second passages, such that particles having a size greater than that which can pass through the third passages are filtered from the fluid.

- [c10] The internal filter of claim 9, further comprising:
 - at least one fourth passage, each fourth passage formed in the first layer and fluidly connected to at least one of the plurality of first passages; and
 - at least one fifth passage, each fifth passage formed in the first layer and fluidly connected to at least one of the second passages.
- [c11] The internal fluid filter of claim 10, wherein a microfluidic device is connected to one of the fourth and fifth passages.
- [c12] The internal fluid filter of claim 10, wherein a fluid source is connected to one of the fourth and fifth passages.
- [c13] A fluid system comprising:
 - a fluid source;

a fluid sink; and
the internal fluid filter of claim 10, wherein the fluid source is connected to one of the fourth and fifth passages and the fluid sink is connected to the other of the fourth and fifth passages.

[c14] The internal fluid filter of claim 9, further comprising:
a third layer and a fourth layer provided between the first and second substrates;
a second plurality of first and second passages provided in the third layer; and
a second plurality of third passages provided in the fourth layer, each third passage of the second plurality of third passages extending between and fluidly connected to one of the second plurality of first passages and one of the second plurality of second passages, wherein fluid can flow into the one of the first and second passages, from the one of the first and second passages into the third passages, and from the third passages into the other of the first and second passages, such that particles having a size greater than that which can pass through the third passages are filtered from the fluid.

[c15] The internal filter of claim 9, wherein the first and second layers form a first set of first and second layers, the internal filter further comprising:

a second set of first and second layers;
additional first and second passages formed in the first layer of the second set of first and second layers; and
additional third passages formed in the second layer of the second set of first and second layers, each of the additional third passages extending between and fluidly connected between one of the additional first and one of the additional second passages.

[c16] The internal filter of claim 9, further comprising:
at least one fourth passage, each fourth passage formed in the first layer and connected to at least one of a first subset of the first passages;
at least one fifth passage, each fifth passage formed in the first layer and connected to at least one of a second subset of the first passages;
wherein at least one second passage is fluidly connected by the third passages to at least one of the first subset of the first passages and at least one of the second subset of first passages.

[c17] The internal filter of claim 16, wherein at least one second passage that is fluidly connected to at least one of the first subset of the first passages and at least one of the second subset of first passages comprises:
a first portion fluidly connected to the at least one of

the first subset of passages; and
a second portion fluidly connected to the at least one
of the second subset of passages;
wherein a microfluidic device is connected to the first
and second portions of that second passage.

[c18] An internal fluid filter, comprising:
a first substrate;
a second substrate;
an intermediate layer provided between the first and
second substrates;
a plurality of first passages provided in the first sub-
strate;
a plurality of second passages provided in one of the
first and second substrates; and
a plurality of third passages provided in the interme-
diate layer, each third passage extending between
and fluidly connected to one of the first passages
and one of the second passages, wherein fluid can
flow into the one of the first and second passages,
from the one of the first and second passages into
the third passages, and from the third passages into
the other of the first and second passages, such that
particles having a size greater than that which can
pass through the third passages are filtered from the
fluid.

- [c19] The internal fluid filter of claim 18, further comprising:
at least one fourth passage, each at least one fourth passage fluidly connected to at least some of the plurality of first passages; and
at least one fifth passage, each at least one fifth passage fluidly connected to at least some of the plurality of second passages.
- [c20] The internal fluid filter of claim 19, wherein a microfluidic device is connected to one of the at least one fourth passage and the at least one fifth passage.
- [c21] The internal fluid filter of claim 19 wherein a fluid source is connected to one of the at least one fourth passage and the at least one fifth passage.
- [c22] A fluid system comprising:
a fluid source;
a fluid sink; and
the internal fluid filter of claim 19, wherein the fluid source is connected to a fourth passage or a fifth passage and the fluid sink is connected to the other of a fourth passage or a fifth passage.
- [c23] The internal filter of claim 18, further comprising:
a plurality of fourth passages, each fourth passage fluidly connected to at least one of the plurality of

first passages; and

a plurality of fifth passages, each fifth passage fluidly connected to at least one of the second passages.

[c24] The internal filter of claim 18, further comprising:
at least one fourth passage, each fourth passage connected to at least one of a first subset of the first passages;
at least one fifth passage, each fifth passage connected to at least one of a second subset of the first passages;
wherein at least one second passage is fluidly connected by the third passages to at least one of the first subset of the first passages and at least one of the second subset of first passages.

[c25] The internal filter of claim 24, wherein at least one second passage that is fluidly connected to at least one of the first subset of the first passages and at least one of the second subset of first passages comprises:
a first portion fluidly connected to the at least one of the first subset of passages; and
a second portion fluidly connected to the at least one of the second subset of passages;
wherein a microfluidic device is connected to the first and second portions of that second passage.

[c26] An internal fluid filter, comprising:

at least one first passage;

at least one second passage;

a plurality of third passages, each third passage connected to one of the at least one first passage;

a plurality of fourth passages, each fourth passage connected to one of the at least one second passage;

and

a plurality of fifth passages, each fifth passage extending between and fluidly connected to one of the third passages and one of the fourth passages, wherein fluid can flow into the one of the first and second passages, from the one of the first and second passages into one of the plurality of third passages and the plurality of fourth passages, respectively, from the one of the plurality of third passages and the plurality of fourth passages into the plurality of fifth passages, from the fifth passages into the other of the plurality of third passages and the plurality of fourth passages, and from the one of the plurality of third passages and the plurality of fourth passages into the other of the first and second passages, such that particles having a size greater than that which can pass through the fifth passages are filtered from the fluid.

- [c27] The internal fluid filter of claim 26, wherein at least one microfluidic device is connected to at least one of the at least one first passage or to at least one of the at least one second passage.
- [c28] The internal fluid filter of claim 26, wherein at least one fluid source is connected to at least one of the at least one first passage or to at least one of the at least one second passage.
- [c29] A fluid system comprising:
at least one fluid source;
at least one fluid sink; and
the internal fluid filter of claim 26, wherein the at least one fluid source is connected to at least one of the at least one first passage or to at least one of the at least one second passage and the at least one fluid sink is connected to the other of at least one of the at least one first passage or to at least one of the at least one second passage.
- [c30] The fluid system of claim 29, wherein at least one of the at least one fluid source and the at least one fluid sink is a microfluidic device.
- [c31] The internal filter of claim 26, wherein:
the at least one first passage comprises a plurality of

first passages, each first passage fluidly connected to at least one of the plurality of third passages; and the at least one second passage comprises a plurality of second passages, each second passage fluidly connected to at least one of the fourth passages.

- [c32] The internal filter of claim 31, wherein each of the plurality of first passages is connected to a different fluid source.
- [c33] The internal filter of claim 32, wherein each of the plurality of second passages is connected to a different fluid sink.
- [c34] The internal filter of claim 32, wherein each of the plurality of second passages is connected to a single fluid sink.
- [c35] The internal filter of claim 31, wherein each of the plurality of second passages is connected to a different fluid sink.
- [c36] The internal filter of claim 35, wherein each of the plurality of first passages is connected to a single fluid source.
- [c37] An internal fluid filter, comprising:
 - a first passage;

a second passage;
a third passage;
a plurality of fourth passages, each fourth passage connected to the first passage;
a plurality of fifth passages, each fifth passage connected to the second passage; and
a plurality of sixth passages, each sixth passage extending between and fluidly connected to the third passage and one of the fourth passages and the fifth passages, wherein fluid can flow into one of the first and second passages, from the one of the first and second passages into one of the plurality of fourth passages and the plurality of fifth passages, respectively, from the one of the plurality of fourth passages and the plurality of fifth passages into the plurality of sixth passages, from the sixth passages into the third passage, from the third passage into the other of the plurality of fourth passages and the plurality of fifth passages, and from the other one of the plurality of fourth passages and the plurality of fifth passages into the other of the first and second passages, such that particles having a size greater than that which can pass through the sixth passages are filtered from the fluid.

[c38] The internal filter of claim 37, wherein the third passage

comprises:

a first portion fluidly connected by the sixth passages to the plurality of fourth passages; and
a second portion fluidly connected by the sixth passages to the plurality of fifth passages;
wherein a microfluidic device is connected between the first and second portions of the third passage.

[c39] The internal filter of claim 37, wherein the first passage is connected to one of a fluid source and a fluid sink and the second passage is connected to the other of the fluid source and the fluid sink.